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PROPOSED
BEST DEMONSTRATED AVAILABLE TECHNOLOGY (BDAT)
BACKGROUND DOCUMENT FOR K086
(INK FORMULATION EQUIPMENT CLEANING WASTES)
(ADDENDUM)

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NOVEMBER 1989

NOTE: This background document is an addendum to the August 1988 Final Best Demonstrated Available Technology (BDAT) Background Document for K086 Solvent Wash (EPA/530-SW-88-031N).

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1. EXECUTIVE SUMMARY

K086 is defined as "solvent washes and sludges, caustic washes and sludges, or water washes and sludges from cleaning tubs and equipment used in the formulation of ink from pigments, driers, soaps and stabilizers containing chromium and lead" (40 CFR 261.32). Although these listing criteria suggest three treatability groups, the Agency believes that it is unnecessary to subcategorize this waste code (beyond subcategorization of wastewaters and nonwastewaters).

To date only the solvent wash form of K086 has been regulated. This was done as part of the First Third rulemaking (53 FR 31138, August 17 1988). Since promulgation of the final rule for the First Third, the Agency has obtained additional K086 waste characterization data and has performed additional analyses. This new information has enabled the Agency to re-evaluate the existing K086 treatment standards, to develop the proposed revisions for K086 (solvent washes), and to develop the proposed treatment standards and approach of all K086 wastes.

The proposed revisions for K086 (solvent wash) are to add new constituents candidate for regulation and to revise the August 17, 1988, promulgated treatment standards for them. The proposed revisions for K086 (solvent washes) would apply to all forms of K086 wastewaters and nonwastewaters. See Section 4 for detailed information regarding these revisions.

This background document presents the additional data and analyses that are the support for the proposed K086 treatment standards. This background document is an addendum to the August 1988 background document for K086 solvent wash (USEPA 1988a).

The Agency has obtained additional waste characterization data regarding caustic washes, caustic wash sludges, and solvent wash

sludges. These new data are presented later in this addendum, together with waste characterization data originally presented in the K086 solvent wash background document. In addition, the Agency has contacted numerous ink formulators informally to obtain qualitative information regarding both K086 waste characterization and industry practices regarding K086 treatment and disposal. Based on analysis of both the old data and the new data, the Agency concludes that the various forms of K086 are sufficiently similar to enable the selection of a single best demonstrated available technology (BDAT) train and a single set of treatment standards for all forms of K086.

BDAT for all forms of K086 is incineration for the proposed organics and cyanide for regulation in these wastes and hexavalent chromium reduction to trivalent chromium, followed by lime precipitation and sludge filtration with stabilization of the sludge, for the proposed metals (chromium and lead) for regulation in these wastes.

Proposed treatment standards for all forms of K086 are contained in Table 1-1. There are a number of differences between the treatment standards contained in Table 1-1 and the treatment standards promulgated for K086 solvent wash as part of the First Third rulemaking. These differences include:

- Addition of cyanide and expansion of the number of semivolatile organic constituents to incorporate the Agency's latest waste characterization data and analyses and

- Revision of numerical values of some treatment standards originally promulgated August 17, 1989.

Standards for K086 solvent wash promulgated as part of the First Third rulemaking remain in effect until promulgation of the Third Third

rule on May 8, 1990, at which time the existing treatment standards may be superseded by the Third Third standards.

For the applicability of the proposed standards a wastewater is defined as wastes containing less than 1 percent (weight basis) total suspended solids* and less than 1 percent (weight basis) total organic carbon (TOC). Waste not meeting this definition must comply with the proposed treatment standards for nonwastewaters.

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* The term "total suspended solids" (TSS) clarifies EPA's previously used terminology of "total solids" and "filterable solids." Specifically, the quantity of total suspended solids is measured by Method 209C (total suspended solid dried at 103°C to 105°C) in Standard Methods for the Examination of Water and Wastewater, 15th edition (APHA, AQQA, and WPCF 1985).

Table 1-1 BDAT Treatment Standards for K086

Constituent	Maximums (grab samples)		
	Nonwastewater		Wastewater
	Total concentration (mg/kg)	TCLP leachate concentration (mg/l)	Total concentration (mg/l)
Volatile Organics			
Acetone	0.14	NA	0.25
n-Butyl alcohol	2.6	NA	0.56
Ethyl acetate	5.6	NA	0.0052
Ethylbenzene	33	NA	0.032
Methanol	140	NA	0.033
Methyl ethyl ketone	200	NA	0.14
Methyl isobutyl ketone	33	NA	0.028
Methylene chloride	31	NA	0.037
Toluene	28	NA	0.032
1,1,1-Trichloroethane	6.2	NA	0.007
Trichloroethylene	5.6	NA	0.007
Xylene (total)	33	NA	0.028
Semivolatile Organics			
Acetophenone	9.6	NA	0.17
Bis(2-ethylhexyl)phthalate	28	NA	0.54
Butylbenzylphthalate	28	NA	0.54
Cyclohexanone	1.9	NA	1.4
1,2-Dichlorobenzene	6.2	NA	0.058
Diethyl phthalate	28	NA	0.54
Dimethyl phthalate	28	NA	0.54
Di-n-butyl phthalate	28	NA	0.54
Di-n-octyl phthalate	28	NA	0.54
Napthalene	5.9	NA	0.007
Nitrobenzene	14	NA	0.033
Metals			
Chromium (total)	NA	0.094	0.32
Lead	NA	0.37	0.037
Other			
Cyanide	1.5	NA	1.9

NA = Not applicable.

2. INDUSTRIES AFFECTED AND WASTE CHARACTERIZATION

2.1 Industries Affected

The Agency has no new data that would change the description of the ink formulation industry contained in the K086 solvent wash background document.

2.2 Waste Characterization

The Agency has obtained information regarding K086 sludges and caustic/water wash wastes since promulgation of the First Third final rule. This information is presented in Table 2-1. Table 2-1 also contains the data regarding K086 solvent wash that were in the K086 solvent wash background document. Note that the liquid portion of the caustic wash, although consisting of mostly water, contains total organic carbon of 26,000 mg/l. This liquid is a nonwastewater under the Agency's definitions because its organic content is greater than 1 percent by weight. (In the K086 solvent wash background document (USEPA 1988a), wastewaters are defined as wastes containing less than 1 percent (weight basis) total suspended solids and less than 1 percent (weight basis) total organic carbon. Wastes not meeting this definition are considered nonwastewaters.)

Table 2-1 contains composition data for K086 solvent wash liquid wastes and sludge wastes and for K086 caustic wash liquid wastes and sludge wastes. The data for K086 solvent wash liquid wastes were reported in the K086 solvent wash background document (USEPA 1988a) and are repeated in Table 2-1 for convenience. The data for the caustic wash liquid and sludge wastes were obtained by sampling and analysis of one ink formulator's wastes (USEPA 1989c). The data for solvent wash sludge were obtained by sampling and analysis of another ink formulator's waste (Versar 1988a).

Table 2-1 K086 Waste Characterization Data

BDAT reference number	Analyte	Untreated K086 solvent wash liquid waste concentration (mg/kg) (1)	(1)	Untreated K086 caustic wash waste concentration Liquid (mg/l) (2)	Sludge (mg/kg) (2)	Untreated K086 solvent wash sludge waste concentration (mg/kg) (3)
	Volatile Organics					
222	Acetone	CBI	-	3	ND	CBI
21	Dichlorodifluoromethane	-	-	ND	6.5	CBI
225	Ethyl acetate	-	256,000	ND	ND	CBI
226	Ethylbenzene	CBI	-	ND	ND	CBI
34	Methyl ethyl ketone	CBI	-	-	-	CBI
229	Methyl isobutyl ketone	CBI	-	ND	ND	CBI
38	Methylene chloride	CBI	-	1.5	80	CBI
42	Tetrachloroethene	-	-	0.52	ND	CBI
43	Toluene	CBI	-	3.6	380	CBI
45	1,1,1-Trichloroethane	CBI	-	ND	5.3	CBI
215-7	Xylene (total)	CBI	-	ND	9.1	CBI
	Semivolatile Organics					
53	Acetophenone	-	-	ND	19	CBI
70	bis(2-Ethylhexyl)phthalate	CBI	-	ND	37	CBI
232	Cyclohexanone	CBI	-	ND	ND	CBI
98	Di-n-butyl phthalate	-	-	ND	83	CBI
	Isophorone	CBI	-	ND	ND	CBI
121	Naphthalene	CBI	-	ND	ND	CBI
	Metals					
154	Antimony	CBI	-	0.57	ND	CBI
155	Arsenic	-	-	0.04	1.1	CBI
156	Barium	CBI	0.54	0.46	3,880	CBI
157	Beryllium	-	-	ND	ND	CBI
158	Cadmium	CBI	4.3	0.006	9	CBI
159	Chromium (total)	CBI	116.0	164	1,850	CBI
221	Chromium (hexavalent)	CBI	-	156	257	CBI
160	Copper	-	-	0.34	495	CBI
161	Lead	CBI	1.1	179	9,250	CBI
162	Mercury	-	-	0.03	1.1	CBI
163	Nickel	CBI	2.4	9.9	34.7	CBI
164	Selenium	CBI	0.5	0.6	ND	CBI
165	Silver	CBI	0.32	0.03	2.5	CBI
166	Thallium	-	-	2.2	ND	CBI
167	Vanadium	-	-	ND	ND	CBI
168	Zinc	CBI	1.1	0.22	183	CBI

Table 2-1 (Continued)

BDAT reference number	Analyte	Untreated K086 solvent wash liquid waste concentration (mg/kg) (1)	(2)	Untreated K086 Caustic Wash Waste Concentration Liquid (mg/l) (2)	Sludge (mg/kg) (2)	Untreated K086 solvent wash sludge waste concentration (mg/kg) (3)
	Inorganics Other Than Metals					
	Chloride	-	-	734	263	CBI
169	Cyanide	CBI	-	412	7,120	CBI
170	Fluoride	-	-	475	606	CBI
	Sulfate	-	-	1,420	574	CBI
171	Sulfide	CBI	-	25	131	CBI
	Other					
	pH	CBI	6.3	11.93	11.28	CBI
	Dissolved solids	-	-	71,700	-	CBI
	Moisture	CBI	-	-	456,000	CBI
	Total organic carbon	CBI	-	26,000	203,000	CBI
	Total organic halide	-	-	17	9.1	CBI
	Oven volatiles at 105°C (%)	-	-	90.44	-	CBI
	Ash (%)	CBI	-	4.6	15.96	CBI
	Sulfur (%)	-	-	0.1	0.18	CBI
	Btu/lb (%)	CBI	13,600	<100	<100	CBI
	Carbon (%)	-	-	3.03	22.8	CBI
	Hydrogen (%)	-	-	10.1	8.4	CBI
	Nitrogen (%)	-	-	0.28	1.63	CBI
	Chlorine (%)	-	-	0.1	0.88	CBI
	Moisture by distillation	-	-	-	47.65	CBI
	Volatile matter at 950°F	-	-	-	78.58	CBI
	Total solids	CBI	5,700	-	-	CBI
	Organic ink pigments	-	77,000	-	-	CBI
	Ethyl alcohol	-	667,000	-	-	CBI
	Naphtha	CBI	-	-	-	CBI

CBI Confidential Business Information.
- No analysis performed.
ND Not detected.

Sources: (1) USEPA 1988a (Table 2-3).
(2) USEPA 1989c.
(3) Versar 1988a.

The Agency has obtained no data for K086 water wash liquid wastes and sludge wastes. However, the Agency believes that the compositions of K086 water wash liquids and sludges are similar to the compositions of K086 caustic wash liquids and sludges because water washes and caustic washes are both water-based and because they are both usually used to clean equipment used to formulate similar (water-based) inks. Conceivably, K086 water wash liquids and sludges could contain higher water contents and lower waste constituent concentrations than their K086 caustic wash counterparts because the K086 water wash liquids and sludges lack the caustic cleaning agent. This suggests that K086 water wash liquids and sludges are easier to treat, or certainly no more difficult to treat, than their K086 caustic wash counterparts and that transfer of BDAT and treatment standards from K086 caustic wash to K086 water wash is appropriate.

Table 2-1 shows, as expected, that the sludges from K086 caustic washes and solvent washes contain higher solids contents than do the liquids. Also, the water content of the caustic wash liquids and sludges are higher than those of the solvent wash liquids and sludges. From a treatability standpoint, however, there are many more similarities than differences among the various wastes. Many of the same organic, inorganic, and metal constituents are present in all the wastes. Furthermore, all of the wastes, including the caustic wash liquid, have similar amounts of organics, cyanide, and metals. Despite the fact that it is water-based, the caustic wash liquid waste does not meet the Agency's definition of wastewater. The similarities among the wastes strongly imply that the same treatment train for removing or destroying organics, cyanide, and metals is likely to be appropriate for each waste.

In addition, the Agency has contacted numerous generators or potential generators of K086 (Versar 1988b-d), has monitored technical literature of the ink formulation industry (Flick 1985, Leach 1988, NAPIM 1988), and

has maintained contact with the National Association of Printing Ink Manufacturers. Data from these activities indicate or confirm the following with regard to the business, technology, and operating practices of the printing ink manufacturing industry:

- About one million new ink formulations are prepared yearly and several million ink formulation specifications are retained on active file.
- Formulations are changed and retailored in response to customer needs, market forces, technology advances, and the availability of new or improved raw materials.
- Usage of chromium- and lead-based pigments is decreasing.
- Usage of organic pigments is increasing.
- Ink formulation tubs and equipment are cleaned between batches. Liquids and sludges resulting from cleaning operations are kept in vessels that are separate from the tubs used for ink formulation. Liquids resulting from cleaning operations are generally reused for cleaning. Vessels containing spent cleaning liquids and sludges are emptied periodically, e.g., weekly or monthly, into drums. The drums are shipped to a commercial treater for treatment and disposal.
- A few K086 generators appear to practice limited onsite recycle (e.g., distillation of solvent-containing wastes) or onsite pretreatment (e.g., neutralization) of K086 waste prior to shipment of the waste to a treater.
- Cleaning solutions--both solvent- and water-based--are reused many times for cleaning different formulations before the cleaning solutions are considered "spent."
- Plants generally formulate both solvent/oil-based inks and water-based inks.
- No evidence was found that ink formulation equipment dedicated exclusively to formulation of lead- and/or chromium-containing inks is used. No evidence was found that ink formulation cleaning wastes containing lead or chromium are segregated from ink formulation cleaning wastes that do not contain these metals.

3. APPLICABLE AND DEMONSTRATED TREATMENT TECHNOLOGIES

The Agency has identified no applicable and demonstrated technologies for K086 beyond those already described in the K086 solvent wash background document (USEPA 1988a).

For the reasons discussed below, the Agency believes that the technologies applicable and demonstrated for K086 solvent wash liquid are also applicable and demonstrated for K086 solvent wash sludge. For instance, incineration and fuel substitution technologies have been identified as applicable technologies for organics in solvent wash wastes (USEPA 1988a). As with K086 solvent wash, K086 sludges can be fed to incinerators via conventional centrifugal pumps, positive displacement pumps, ram feeders, or screw feeders. Once organics are treated by incineration, the metals originally in the wastes are contained in the incineration residues such as scrubber water and ashes. Hexavalent chromium can be reduced to trivalent chromium, and the leachability of the trivalent chromium can be decreased by stabilization. However, dissolution of the incinerator ash in water may be needed for subsequent reduction of hexavalent chromium to trivalent chromium, e.g., by water-soluble reducing agents such as sodium bisulfite or the ferrous form of iron. Some K086 sludges resulting from water or caustic washes could be treated by fuel substitution as well as by incineration.

Similarly, organics in K086 wastes resulting from water or caustic cleaning of ink formulation tubs and equipment may also be treated by incineration. This treatment, however, may require relatively substantial amounts of supplemental fuel for proper incineration because of the high concentration of water in the wastes. At least one facility has reported treating K086 liquid wastes resulting from water or caustic washing by incineration. Another way of treating high water content K086 liquid waste includes decanting the liquid from the sludge, partially

treating the liquid to precipitate a portion of the suspended and dissolved solids, and reusing the liquid. Wet air oxidation should also be considered an applicable technology for pretreatment of high water content K086 liquid nonwastewaters, but the Agency is unaware that wet air oxidation has been demonstrated for these wastes or similar wastes.

It is conceivable that biotreatment or treatment with activated carbon could be applicable for treatment of the organics in high water content K086 nonwastewaters and wastewaters. Again, the Agency has no data regarding the performance of these technologies on K086 wastes or similar wastes. Thus, the Agency does not consider these technologies demonstrated for K086 wastes.

4. PERFORMANCE DATA

On August 17, 1988, the treatment standards promulgated for K086 wastes were based on the incineration of a K086 solvent wash. The incineration of this wash yielded an incineration scrubber wastewater and no ash. Characterization of K086 incineration scrubber waters showed that the organics from the untreated K086 solvent wash were substantially reduced but the metals were concentrated in the residue. Based on the above mentioned characterization data of this incineration scrubber waters, EPA identified a metal-bearing wastewater with similar treatability characteristics to the K086 solvent wash that had been treated by hexavalent chromium reduction to trivalent chromium followed by excess lime precipitation and filtration. The wastewater treatment sludge derived from the treatment of this similar metal-bearing wastewater contained detection levels for volatiles and semivolatiles organics. Therefore, the Agency proposed and promulgated treatment standards for the K086 (solvent washes) nonwastewaters based on the highest detection limit of the organic constituents in this similar wastewater treatment sludge.

New information suggests facilities generating K086 may be phasing out the generation of these wastes. However, some facilities still report sporadic generation of K086. EPA believes these wastes can be treated by conventional BDAT technologies such as incineration, fuel substitution, and technologies designed to treat metals. Because of the sporadic generation of K086 wastes, the characteristics of its listing criteria, and the known waste management practices for these wastes, EPA expects residues from the treatment of K086 to show similar analytical difficulties as those shown by U and P wastes. As a result, the Agency is proposing, for the constituents candidate for regulation in K086 wastes (cyanides and organics), the same treatment standards proposed for its U and P counterparts except for methanol. Any deviations from the U and P methodology are noted in Section 7 of this document.

5. IDENTIFICATION OF BEST DEMONSTRATED AVAILABLE TECHNOLOGY (BDAT)

Data regarding characterization of K086 wastes and regarding ink formulation industry practices with regard to K086 treatment and disposal are reported earlier in this addendum and in the original background document. Conclusions drawn from analysis of the data are presented in the section entitled "Industries Affected and Waste Characterization." The Agency has obtained no new numerical treatment performance data.

Based on an examination of both old and new data, the Agency concludes that the best demonstrated available technology (BDAT) for all forms of K086 waste is the same as that for K086 solvent wash as contained in the background document for K086 solvent wash (USEPA 1988a). This conclusion is based on the similarities among the wastes as discussed in the "Industries Affected and Waste Characterization" section.

The Agency believes that K086 wastes generated by ink formulators would rarely meet the Agency's definition of wastewaters (less than 1 weight percent total suspended solids and less than 1 weight percent total organic carbon). Incineration of the as-generated K086 wastes would, however, result in wastewaters, e.g., incinerator scrubber waters, or incinerator ash that has been mixed with water for the purpose of reduction of hexavalent chromium (Cr^{+6}) to trivalent chromium (Cr^{+3}). Both of these wastewaters are considered K086 wastes by virtue of the Agency's "derived from" rule.

The BDAT for K086 wastes contained in the K086 solvent wash background document (USEPA 1988a) is summarized below by major K086 waste component.

Major K086 Waste Component	BDAT
Organics and cyanide	Incineration
Metals	Hexavalent chromium reduction to trivalent chromium followed by lime precipitation and sludge filtration with stabilization of sludge.

As shown, BDAT for organics and cyanide in K086 wastes is incineration and BDAT for chromium and lead in K086 is hexavalent chromium reduction followed by lime precipitation, sludge filtration, and stabilization of the sludge.

6. SELECTION OF REGULATED CONSTITUENTS

The Agency reviewed the list of regulated constituents for the K086 solvent wash in light of the additional data on waste characterization and industry practices. This review resulted in a revised list, which has been expanded by the addition of several constituents. The Agency believes that the revised list is appropriate for all forms of K086 waste.

The characterization data available for K086 wastes show a large number of hazardous constituents in K086 that could be candidates for regulation. The large number of hazardous constituents may be a direct result of the widespread industry practice of reusing the same cleaning/washing solutions to clean the equipment used for the formulation of many different ink batches (USEPA 1980, Versar 1989). Also, some of these hazardous constituents could be residues left in the ink formulation equipment that were originally ingredients or constituents in the feedstock materials used in the formulation of inks. Table 2-1 of this addendum lists all BDAT constituents detected in the K086 wastes characterized by the Agency. Any BDAT list constituent that is present above its detection limit is a candidate for regulation.

EPA is proposing to broaden the list of regulated constituents contained in the K086 solvent wash background document (USEPA 1988a) to account for constituents that are shown in Table 2-1 of this addendum but were not regulated in the First Third K086 solvent wash rulemaking. The constituents on the broadened list are acetophenone, butyl benzyl phthalate, di-n-butyl phthalate, and cyanide.

In addition, EPA proposes to regulate several other BDAT list constituents. These other constituents, which are listed in Table 6-1, are phthalate constituents. These additional phthalates are proposed for regulation either because they are reported as ink formulation ingredients (Flick 1985) or because they are BDAT list phthalates that

could be used as substitutes for the phthalates shown in Table 2-1. Three phthalates--bis (2-ethylhexyl) phthalate, butyl benzyl phthalate, and di-n-butyl phthalate--are shown in Table 2-1. The Agency believes that the additional phthalates shown in Table 6-1 should also be regulated because the members of the regulated community can simply switch from regulated BDAT list phthalates to nonregulated BDAT list phthalates in order to avoid regulation. The Agency, however, solicits comments on this approach. This approach is consistent with the Agency's determinations for the solvent standards already promulgated in the First Third final rule (53 FR 31138).

Table 6-1 Additional Candidates for Regulation of K086

BDAT reference number	Constituent
92	Diethyl phthalate
97	Dimethyl phthalate
104	Di-n-octyl phthalate

The Agency believes that treatment of regulated BDAT constituents to levels given in this addendum will result in essentially complete removal or destruction of unregulated BDAT list constituents.

The Agency considered adding additional metals to lead and chromium, which were regulated for K086 solvent wash. For example, both barium and cadmium were considered for addition. However, the Agency decided not to add additional metals for this rulemaking because the Agency believes regulation of chromium and lead will provide for regulation of barium and cadmium, as well as other BDAT metals that may be present in K086 wastes. This is because those processes used to reduce lead and chromium

concentrations in the K086 treatment residual leachate to below the treatment standards are also known to reduce concentrations of other metals in the K086 treatment residual leachate. This is shown by data in Table 4-2 of the K086 solvent wash background document (USEPA 1988a).

7. DEVELOPMENT OF BDAT TREATMENT STANDARDS

The explanation of the calculation of the treatment standards is given below on a constituent-by-constituent basis, in approximately the same order as that in Table 1-1.

The Agency points out that many of the treatment standards for individual regulated constituents are now different than the treatment standards set for K086 solvent wash in the First Third rulemaking, particularly regarding organic constituents. This is because of the Agency's belief that treatment, particularly incineration, of K086 wastes is often done with other hazardous and nonhazardous wastes (i.e., co-incineration). The mixing of K086 wastes with other solvents as well as other hazardous/nonhazardous wastes prior to incineration may result in treatment residuals (incinerator ashes and scrubber waters) that could vary in composition, possibly affecting detection limits for the regulated organic constituents.

Several commenters to the First Third rule expressed the above concern regarding achieving K086 solvent wash standards. Thus the Agency is proposing to revise the promulgated standards for K086 solvent wash in order to address the issue. The Agency requests comments on this approach.

With regard to the coincineration issue, the Agency believes that treatment of K086 is similar to the offsite treatment of P and U wastes. That is, P and U wastes that are not treated at the site where they are generated are shipped to commercial treatment facilities where the P and U wastes are treated along with other wastes. Since both K086 wastes and P and U wastes are likely to be commingled with other wastes for treatment by incineration, the Agency believes it is appropriate that organic constituents of K086 have the same treatment standards as their P and U counterparts.

In conjunction with this and prior rulemakings, the Agency has examined numerous sets of data for incineration of wastes containing organic constituents that are the same as or similar to the organic constituents found in K086 wastes. Based on these examinations, the Agency believes that well-designed, well-operated incinerators are capable of destroying organics in K086 waste to concentrations well below the standards being proposed for K086 organic constituents, whether or not the K086 wastes are mixed with other hazardous or nonhazardous wastes.

Recently, additional wastewater treatment data primarily from EPA's Office of Water have been analyzed for the development of concentration-based treatment standards for many of the U and P wastes. These data include the treatment of wastewaters that are not specifically listed as U or P wastewaters, but do contain many of the corresponding U or P constituents. While these data were not available in time to incorporate into this addendum, these data are being placed in the administrative record for the K086 waste code. Furthermore, the Agency has decided to propose alternative concentration-based treatment standards, based on the aforementioned data for all U and P wastewaters for which standards based on incinerator scrubber waters have been proposed. Further information on these alternative standards can be found in the preamble for the proposed rule and in the document "Best Demonstrated Available Technology (BDAT) Background Document for Wastewaters Containing BDAT List Constituents."

The Agency is also in the process of conducting wastewater treatment tests for selected U and P chemicals using wet air oxidation, powdered activated carbon treatment (PACT), and carbon adsorption. Since much of the currently available wastewater treatment data is from the treatment of relatively low concentrations of U and P constituents in industrial wastewaters, these tests have been designed to examine the applicability of treatment technologies to wastewaters containing relatively high

concentrations of U and P constituents. The data developed in these studies will be placed in the administrative record for inspection and comment, when they become available. Further information on the availability of the forthcoming wastewater treatment test data can be found in the preamble for the proposed rule.

7.1 Volatile Organics

7.1.1 Acetone

For nonwastewaters, the Agency has examined data for incineration of four different acetone-containing wastes in four different incinerators (USEPA 1989d). This examination was conducted in conjunction with the Third Third rulemaking for U002. Acetone was not detected in ashes resulting from incineration of the four wastes. The highest detection limit was 0.05 ppm. The Agency used the highest detection limit together with an accuracy correction factor of 1.01 and a variability factor of 2.8 to calculate a treatment standard of 0.14 mg/kg acetone for U002. This standard is transferred to acetone in K086 nonwastewaters.

In contrast, the acetone standard for K086 solvent wash nonwastewater in the First Third rulemaking was determined based on the acetone detection limit in a filter cake resulting from the filtration of a metal-bearing wastewater that had been treated to precipitate metals. This resulted in a standard of 0.37 mg/l acetone. The Agency notes that today's proposed standard for acetone is based on acetone detection limits in incinerator ash. Because incineration processes destroy acetone, and the resulting matrices reflect the treatment of K086 wastes that yield ash, the Agency believes this new standard is more realistic than the one previously promulgated for K086 solvent washes.

For wastewaters, the Agency is basing the standard for acetone on the scrubber waters resulting from incineration of K086 solvent wash and

other acetone-containing hazardous wastes. The Agency believes, based on examination of data for incineration of acetone-containing wastes, that incineration of K086 waste in a well-designed and well-operated incinerator will always result in scrubber water with nondetectable levels of volatile and semivolatile organics because a well-designed and well-operated incinerator destroys such compounds.

The Agency notes that the detection limits for the 1987 K086 test burn at the Agency's Combustion Research Facility were 0.005 mg/l for acetone and 0.005 mg/l or 0.010 mg/l for the other volatile and semivolatile organics that the Agency has chosen to regulate in K086 (except methanol, ethyl acetate, and n-butanol, which were not analyzed). (See Tables 4-1 and C-2 of the K086 solvent wash background document (USEPA 1988a).)

Data for organics in scrubber waters from well-designed and well-operated incinerators that treat acetone-containing wastes show the scrubber waters to be essentially devoid of volatile and semivolatile organics, but these scrubber waters may contain varying amounts of particulates and dissolved salts. Conceivably, the quantities and types of particulates and dissolved salts could affect detection limits for organics. Indeed, acetone detection limits for the scrubber waters of the four incineration tests mentioned earlier, ranged from 0.01 mg/l to 0.05 mg/l. Thus, the Agency examined available data for the incineration of acetone-containing wastes in an effort to account for the diversity of wastes that can affect the detectability of acetone in incinerator scrubber waters. As a result, the Agency is proposing treatment standards based on the highest detection limits for acetone in incineration scrubber water rather than the detection limits attained for analysis of the 1987 K086 test burn. Based on examination of the detection limits of acetone and other organics, the Agency believes that the achievable detection limit for acetone in K086 scrubber water is 0.05 mg/l.

The Agency used a detection limit of 0.05 mg/l, an accuracy correction factor of 1.79, and a variability factor of 2.8 to calculate a treatment standard for acetone in U002 wastewaters (USEPA 1989d) of 0.25 mg/l. This standard is transferred to acetone in K086 wastewaters.

7.1.2 n-Butyl Alcohol

The Agency believes that n-butanol would be essentially completely destroyed in a well-designed, well-operated incinerator. Analyses of incinerator ash and scrubber waters would show nondetectable concentrations of n-butanol. Thus, performance data from well-designed and well-operated incinerators would always show nondetectable concentrations of n-butanol in the incinerator residuals.

In conjunction with setting treatment standards for n-butanol in U031, the Agency examined detection limits for n-butanol in incinerator ash and incinerator scrubber water. In many cases there were no attempts made to analyze for n-butanol and therefore no detection limit data were available. However, the Agency did find detection limit data for analysis of incinerator residuals from one incinerator. These limits were 0.4 mg/kg and 0.2 mg/l for n-butanol in the ash and scrubber water, respectively. The Agency used an accuracy correction factor of 2.33 and a variability factor of 2.8 to calculate a treatment standard for n-butanol of 2.6 in U031 nonwastewaters. The Agency used an accuracy correction factor of 2.56 and a variability factor of 2.8 to calculate a treatment standard for n-butanol of 0.56 in U031 wastewaters. These standards are transferred to n-butanol in K086 nonwastewaters and wastewaters, respectively. The data and process by which standards were derived for U031 are described in the background document for oxygenated hydrocarbons (USEPA 1989d).

7.1.3 Ethyl Acetate

In conjunction with the rulemaking for oxygenated hydrocarbon U-wastes, the Agency is proposing treatment standards for ethyl acetate (U112) of 5.6 mg/kg for nonwastewaters and 0.0052 mg/l for wastewaters (USEPA 1989d). The Agency proposes to transfer these standards to ethyl acetate in K086 nonwastewaters and wastewaters.

7.1.4 Ethylbenzene, Toluene, and Xylene (total)

In conjunction with the rulemaking for aromatic hydrocarbon U-wastes, the Agency is proposing treatment standards for toluene (U220) and total xylene (U239) (USEPA 1989e). For U220 and U239 nonwastewaters, the standards are 28 mg/kg toluene and 33 mg/kg total xylene. For U220 and U239 wastewaters, the standards are 0.028 mg/l toluene and 0.032 mg/l total xylene. The differences between the toluene and total xylene standards are caused by differences in the accuracy correction factors. The Agency proposes to transfer the U220 and U239 treatment standards to toluene and total xylene in K086 nonwastewaters and wastewaters. The Agency also proposes to transfer the higher of the U220 and U239 standards to ethylbenzene in K086 wastes. The Agency notes that light aromatic hydrocarbons in treated waste residuals almost always have the same detection limits and usually have accuracy correction factors that are similar. Thus the transfer of the higher of U220 and U239 standards to ethylbenzene is reasonable and conservative.

Summarizing, proposed treatment standards for ethylbenzene, toluene, and total xylene for K086 nonwastewaters are 33 mg/kg, 28 mg/kg and 33 mg/kg, respectively. The proposed treatment standards for ethylbenzene, toluene and total xylene for K086 wastewaters are 0.032 mg/l, 0.028 mg/l and 0.032 mg/l, respectively.

7.1.5 Methanol

The Agency lacks performance data for the incineration of wastes containing methanol. Furthermore, the Agency lacks data for methanol detection limits in incineration ashes or scrubber waters.

The main reason that the Agency lacks data on methanol is that it typically utilizes data for volatile compounds that are obtained through the analysis of samples by gas chromatography/mass spectrometry (GC/MS). The mass spectrum of methanol is difficult to distinguish from other low molecular weight species. Therefore the quantification of methanol by GC/MS techniques is difficult and as a result methanol is not routinely analysed.

The Agency is aware of GC methods that can analyze for methanol in wastewaters; however, it currently has no data for the analysis of nonwastewaters using GC methods. Additional data primarily from the Agency's Office of Water are available for the treatment of alcohols similar to methanol in wastewaters. A concentration-based standard for methanol in wastewater forms of multi-source leachate has been calculated using these data and is presented in the preamble for the proposed rule. For methanol nonwastewater, the Agency proposes a treatment standard based on the detection limit for this constituent. The standard is calculated by multiplying 250 mg/kg, the detection limit (USEPA, 1986), by 0.20, the accuracy correction factor accepted by the Agency, and by 2.8, the variability factor.

The accuracy correction factor is the amount of constituent recovered after spiking. The lowest accuracy correction factor accepted by the Agency is 20 percent. An accuracy correction factor less than that cannot be used to set treatment standards becuase the Agency does not

have sufficient confidence in such value to set a national standard. The variability factor is an estimate of the daily maximum variability. It is calculated based on estimate of performance values for which 99 percent of the daily observations will be below and the average of the individual performance values. The variability factor used by the Agency when there is no actual analytical data or the data is below the detection limit is 2.8. For more information about variability factors and recoveries see USEPA 1989b. The treatment standard for the nonwastewater forms of methanol is 140 mg/kg.

For methanol wastewaters, the Agency proposes a treatment standard based on the data collected by the Agency in the Effluent Guidelines Project. The effluent concentrations ranged from 10 ppb to 290,000 ppb. The BDAT treatment standard was set using an achievable effluent of 10 ppb. The resulting BDAT treatment standard for methanol, proposed by the Agency is 0.033 mg/l. This standard is based on analysis of a composite sample using SW-846 Method 8000 (USEPA 1986). As in U154 (methanol) wastes, the Agency solicits comments, and data that support the establishment of a concentration-based standard for methanol in K086 wastes.

7.1.6 Methyl Ethyl Ketone and Methyl Isobutyl Ketone

In conjunction with the rulemaking for U159 (methyl ethyl ketone) and U161 (methyl isobutyl ketone), the Agency examined results of incinerating several different wastes containing these constituents in several different incinerators (USEPA 1989d). The constituents were not detected in incinerator ash or scrubber water in all cases except one case where the blank was contaminated with methyl ethyl ketone. The Agency did not use the methyl ethyl ketone data for the case where the blank was contaminated with methyl ethyl ketone. In the other cases,

detection limits for methyl ethyl ketone and methyl isobutyl ketone in incinerator ashes ranged from 0.01 mg/kg to 10 mg/kg and from 0.02 mg/kg to 10 mg/kg respectively. Detection limits for methyl ethyl ketone and methyl isobutyl ketone in scrubber water ranged from 0.01 mg/l to 0.05 mg/l for methyl ethyl ketone and were 0.01 mg/l in all cases for methyl isobutyl ketone.

To determine the treatment standard for methyl isobutyl ketone in U161 nonwastewater, the Agency used the detection limit of 10 mg, an accuracy correction factor of 1.19 and a variability factor of 2.8. The Agency proposes to transfer the resultant standard of 33 mg/kg for methyl isobutyl ketone in U161 nonwastewater to methyl isobutyl ketone in K086 nonwastewater. The Agency proposes to transfer the treatment standards for methyl ethyl ketone in U159 nonwastewater to methyl ethyl ketone in K086 nonwastewater. The proposed treatment standard is 200 mg/kg.

For wastewater the Agency calculated standards of 0.14 for methyl ethyl ketone in U159 and 0.028 for methyl isobutyl ketone in U161 (USEPA 1989d). The Agency proposes to transfer these standards to methyl ethyl ketone and methyl isobutyl ketone in K086 wastewaters.

7.1.7 Methylene Chloride, 1,1,1-Trichloroethane, and Trichloroethylene

The Agency is proposing treatment standards for methylene chloride, 1,1,1-trichloroethane, and trichloroethylene in U080, U226, and U228 in conjunction with the regulation of halogenated aliphatic U-wastes (USEPA 1989f). The proposed treatment standards are based on examination of performance data and detection limits of many incinerator ashes and scrubber waters resulting from treatment of wastes containing halogenated aliphatics.

The Agency proposes to transfer the standards for U080, U226, and U228 to K086. Thus for K086 nonwastewaters the proposed standards are 31 mg/kg, 6.2 mg/kg and 5.6 mg/kg for methylene chloride, 1,1,1-trichloroethane and trichloroethylene, respectively. For K086 wastewaters, the proposed standards are 0.037 mg/l, 0.007 mg/l and 0.007 mg/l for methylene chloride, 1,1,1-trichloroethane and trichloroethylene.

7.2 Semivolatile Organics

The Agency is proposing to regulate the following semivolatile organics in K086 treatment residuals:

Acetophenone
Bis(2-ethylhexyl)phthlate
Butyl benzyl phthalate
Cyclohexanone
1,2-Dichlorobenzene
Diethylphthlate
Dimethylphthlate
Di-n-butylphthlate
Di-n-octylphthlate
Naphthalene
Nitrobenzene

Acetophenome and cyclohexanone U-wastes (U004 and U057, respectively) are being regulated as part of the oxygenated hydrocarbon treatability group (USEPA 1989d). The Agency proposes to transfer standards for U004 and U057 to K086 wastes. Thus the proposed standards for K086 nonwastewaters are 9.6 mg/kg acetophenone and 1.9 mg/kg cyclohexanone. The proposed standards for K086 wastewaters are 0.17 mg/l acetophenone and 1.4 mg/l cyclohexanone.

Phthalate U-wastes were regulated as part of the Agency's Second Third rulemaking. Background data and explanations for the phthalate treatment standards were contained in the background document for phthalate waste (USEPA 1989g). The Agency proposes to transfer the standards for the phthalate U-wastes to the regulated phthalates in K086. Thus the proposed standards for phthalates are 28 mg/kg in K086 nonwastewaters and 0.54 mg/l in K086 wastewaters.

In conjunction with the proposed rulemaking for Third Third wastes, the Agency is proposing standards for 1,2-dichlorobenzene-, napthalene-, and nitrobenzene-containing U-wastes (U020, U165, and U169, respectively). Documentation for the treatment standards for these wastes may be found in their respective background documents (USEPA 1989h, USEPA 1989i, USEPA 1989j). The Agency proposes to transfer the standards for U020, U165, and U169 to K086 wastes. Thus the proposed treatment standards for K086 nonwastewaters are 6.2 mg/kg, 1,2-dichlorobenzene, 5.9 mg/kg naphthalene, and 14 mg/kg nitrobenzene. For K086 wastewaters, the proposed treatment standards are 0.058 mg/l 1,2-dichlorobenzene, 0.007 mg/l naphthalene, and 0.033 mg/l nitrobenzene.

7.3 Metals

The Agency believes that the standards for metals given in the K086 solvent wash background document are applicable to all forms of K086 wastes. The Agency recognizes that as-generated K086 wastes may have different compositions (see Table 2-1). Consequently, different as-generated K086 wastes may require different pretreatment steps prior to application of chromium reduction/lime precipitation/stabilization steps. Suitable pretreatment, e.g., by incineration to destroy organics and cyanide, would lead to feeds to the chromium reduction/lime precipitation/stabilization steps that are similar with respect to chromium and lead, regardless of the initial compositions of the as-generated K086 wastes. Thus, the Agency is retaining the K086 solvent wash metals standards and making them applicable to all forms of K086 wastes. For nonwastewaters the standards are 0.094 mg/l chromium and 0.37 mg/l lead in the TCLP leachate, for wastewaters the standards are 0.32 mg/l chromium and 0.037 mg/l lead.

7.4 Cyanide

For cyanide in K086, the Agency is proposing standards based on previously promulgated standards for F010 (USEPA 1989k). These standards are 1.5 mg/kg cyanide for nonwastewaters and 1.9 mg/l cyanide for wastewaters.

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